



# Monitoring The Effects Of Explosives Testing On The Architecture At Nake'muu

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## INTRODUCTION

The Cultural Resources Team of ESH-20 is conducting a long-term monitoring program at the ancestral pueblo of Nake'muu (LA 12655). The program is being implemented as part of the Mitigation Action Plan for the Dual Axis Radiographic Hydrodynamic Test (DARHT) Facility Environmental Impact Statement. Nake'muu is the only ancestral pueblo at LANL that still retains its original standing walls. The site has been mapped and photographed and detailed drawings have been made of all the standing walled masonry architecture. This baseline database will be updated on an annual basis and continual assessments will be made of site condition, deterioration rate, and possible sources of impact.

Nake'muu Ruin is situated high above the confluence of two deeply entrenched canyons at the end of a narrow finger of the mesa at an elevation of 2200 m (7220 ft). The name Nake'muu means "village on the edge" or "village at the point" in Tewa, the language spoken by six of the northern Rio Grande Pueblos. The site is an ancestral home of these Pueblo people who refer to it in their oral histories and songs. Nake'muu appears to date to the Coalition Period, circa A.D. 1200 to 1325. It contains about 55 rooms with walls standing up to six feet in height. As such, it represents one of the best preserved ruins on the Pajarito Plateau.



## OBJECTIVES

The primary objective of this project is to identify and evaluate the long-term effects of the ambient environment, and the DARHT facility operations on the architecture at Nake'muu. Is the dynamic-testing program affecting the site? If so, to what degree, and what are the short-term and long-term implications of this activity?

## METHODS AND PRELIMINARY RESULTS

The site monitoring program involved making a site map and detailed drawings of every standing wall. A 15 cm contour map was made of the site that denoted wall outlines and specific room numbers. Fifty-five rooms and thirteen open areas were defined. In addition, individual maps were drawn of each room. These consist of plan maps and standing wall profiles. The plan maps illustrate wall outline, abutments or bonding between wall segments, the presence of wall fall (i.e., rubble), internal drainage patterns, and vegetation. The wall profiles consist of detailed drawings of individual wall elements, including masonry blocks, chinking stones and plaster that were derived from 1:50 scaled photographs. Each profile is colored coded to denote the level of wall deterioration, adobe mortar loss, and presence of architectural features.

The condition of each wall at Nake'muu was evaluated and classified as to Category 1, 2, 3, or 4. Categories 1–3 represent a continuum from the most fragile to stable walls, with Category 4 representing walls that have fallen to grade. Of the estimated 272 walls at the site, 102 are still standing and 170 have fallen to grade. There are a total of 13 Category 1 walls, ten of which are located on the north-facing side of the room. It is along these north-facing façades that the winter snows tend to build up, with the snow melting during the day and then refreezing at night. This freeze-thaw and contraction/expansion process has a detrimental effect on the wall construction elements.

Most of the Category 4 walls are situated around the periphery of the site in areas affected by sheetwash and a steep break in slope. This includes the northern side of the pueblo and parts of the southern and eastern sections of the site. These walls have presumably collapsed due to the erosion and loss of mortar from the lower sections of the wall. This would especially be a problem during the summer monsoonal rainy season.

On the other hand, Rooms 25–28 and 31 are located on a high spot along a ridge in the western section of the site. This area would not have been greatly affected by seasonal runoff. It is, however, a natural corridor used by elk and people to enter the site. This traffic could have led to the destruction of this roomblock. In addition to the foregoing factors, vegetation root systems are also a problem at the site, since they can undermine and dislodge the basal sections of a wall.



Four separate wall monitoring visits were conducted over a 33 month period from 1997 to 2000. A total of 224 chinking stones and 46 masonry blocks were displaced during this period. If we consider that there were a total of 6578 chinking stones and 3994 building stones forming standing walled architecture at Nake'muu, then we have witnessed a 1% annual displacement of site chinks and 0.4% displacement of masonry blocks. At this same rate, in 25 years individual masonry block loss will approximate 10% and chinking stone loss will approximate 30%, minimum.

Summer rain, winter snow, vegetation, elk and human visitation have all contributed to the deterioration of the architecture at Nake'muu. However, the next phase of the project was designed to quantify the amount of vibration being transmitted from the DARHT facility to Nake'muu. Summer rain, winter snow, vegetation, elk and human visitation have all contributed to the deterioration of the architecture at Nake'muu. However, the next phase of the project was designed to quantify the amount of vibration being transmitted from the DARHT facility to Nake'muu. Summer rain, winter snow, vegetation, elk and human visitation have all contributed to the deterioration of the architecture at Nake'muu. However, the next phase of the project was designed to quantify the amount of vibration being transmitted from the DARHT facility to Nake'muu.

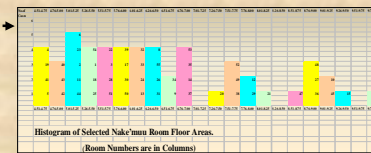


## SITE CONSTRUCTION HISTORY

Nake'muu is organized around a central plaza; however, a closer inspection of the wall construction sequence indicates that two separate linear roomblocks were initially built. These consist of the Southeast Block (rooms 2–12 and 53–54) and the Northwest Block (rooms 28–45). The room blocks are oriented northeast-southwest, contain two rows of rooms, and are seven rooms long. The original doorways opened towards the southeast where outside activity areas were located. Later a series of lateral roomblocks were added enclosing a central plaza. Outside doorways were subsequently sealed and the focus of the pueblo became the central plaza area.



A cursory review of the site map indicates that room size differs across the site. A histogram of room size shows three distinctive modes. That is, small rooms that are from 4–7 m<sup>2</sup> in size, medium rooms that contain 7–8.5 m<sup>2</sup>, and large rooms that are greater than 8.5 m<sup>2</sup> in size. The roomblocks are generally two rooms deep, with medium sized living rooms in the front and smaller storage rooms located at the rear. Large rooms were probably used for communal social activities. For example, several large rooms are located at the entry ways to the central plaza (rooms 45, 47, and 48).



There are very few artifacts present at the site, but previous surface collections identified the presence of mostly Santa Fe Black-on-white reflecting a Coalition period occupation (ca. AD 1200 to 1325). This corresponds with the identification of several Santa Fe Black-on-white sherds that were used as wall chinking stones. Nonetheless, the masonry at Nake'muu is characterized by shaped tuff blocks and chinking stones that are typical of the later Classic period. This contrasts with the Coalition period masonry style that is commonly represented by the use of unshaped blocks without any chinking stones.

A lack of a trash midden, shallow interior rooms deposits (ca. 10 cm), and limited evidence of remodeling would seem to reflect that the site was occupied for a brief period of time. Regional architectural studies indicate that the typical pueblo room had a use-life of about 20 years before some remodeling was necessary. If so, we could conjecture that Nake'muu was occupied for no more than this length of time.

Why the walls at Nake'muu have survived to the present is not known, however, it may be due to several factors: 1) the roofs may have been periodically repaired during site revisits (e.g., during the Pueblo Revolt). If so, the roofs would have continued to protect the walls from the weather; 2) its isolated location, whereby fewer people visited the site; 3) roofing materials might not have been scavenged until the turn of the century when homesteaders moved into the area; and 4) the site has been located in a controlled access area, where visitation was limited.

## CONSULTATION AND COORDINATION WITH ACCORD PUEBLOS

Nake'muu is an ancestral home of the people from San Ildefonso Pueblo. Information on the site has been passed down from generation to generation through oral history and traditional songs. For example, although some of the inhabitants of San Ildefonso sought refuge at Black Mesa during the Pueblo Revolt, many of the women and children hid at Nake'muu. The Pueblo elders speak of traveling the canyons from Navajo to Nake'muu to the Valle Grande; however, the site has not been visited for traditional purposes since the 1950s.



The Cultural Resources Team holds regular meetings with the four Accord Pueblos (San Ildefonso, Santa Clara, Jemez, and Cochiti Pueblo) concerning the possible impact of LANL activities on traditional sites. They are invited for annual visits to Nake'muu to personally view the ruins and consult on the long-term status of the site. San Ildefonso Pueblo has stated that "it is against Tewa belief that any preservation efforts be given to the site." However, this position might change should there be empirical evidence that the dynamic testing program is artificially accelerating the deterioration rate at Nake'muu.

## CONCLUSIONS

In summary, the preliminary results of this three-year monitoring program indicate that there have been some minor changes in the standing walled masonry at Nake'muu, however, a long-term database must be established in order to provide the basis for a more meaningful interpretation of monitoring program results. As the monitoring program progresses, additional data will provide the basis for addressing the following fundamental questions:

- 1) What is the quantifiable relationship between effects from ambient environmental conditions and DARHT facility operations and which of the two factors have the greater impact on the site?
- 2) What is the quantifiable significance of changes that are observed with respect to the condition, long-term protection, and on-going monitoring of Nake'muu?